PERSPECTIVES ON URBAN FORM, ROAD CLASSIFICATION AND ACCESS MANAGEMENT

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• Background
• Spacing Higher Order Roads
• Comparison International Cities
• Access Spacing and Real World Situation
• Application of AM in Practice
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BACKGROUND

• Road classification “foundation of any AM program”

• Higher order routes (Classes 1 to 3): larger road reserves, more lanes – can be barriers – highest vehicle-km of travel – crucial for functioning of city

Objectives:

1. Evaluate spacing higher order routes in selected cities – should these routes be underprovided, then question wrt spacing guidelines

2. Investigate consequences of spacing guidelines on real world situations
SPACING HIGHER ORDER ROADS

• Major roads important “form giving” element – together with surface rail lines

• So: What is ideal form?

What should be spacing of major roads?

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Principal Arterial</td>
<td>Principal Arterial</td>
<td>Freeway</td>
<td>Freeway</td>
</tr>
<tr>
<td>2</td>
<td>Major Arterial</td>
<td>Minor Arterial</td>
<td>Strategic/Principal/Major Arterial</td>
<td>Major Arterial</td>
</tr>
<tr>
<td>3</td>
<td>Minor Arterial</td>
<td>Collector</td>
<td>Minor Arterial</td>
<td>Minor Arterial</td>
</tr>
<tr>
<td>4</td>
<td>Collector</td>
<td>Local Street</td>
<td>Major and Minor Collector</td>
<td>Major Collector</td>
</tr>
<tr>
<td>5</td>
<td>Local Street</td>
<td>Local Street</td>
<td>Local Street</td>
<td>Minor Collector</td>
</tr>
<tr>
<td>6</td>
<td>Ped Walkway</td>
<td></td>
<td></td>
<td>Local</td>
</tr>
</tbody>
</table>
Main city components:

- CBD (s) or business districts
- Industrial areas
- Residential areas
- Green areas

Basically three forms for major roads

- Radial
- Rectangular Grid
- Mixture of these

Open or Closed Local Networks
SPACING MAJOR ROADS (1)

- Guidelines have been developed

<table>
<thead>
<tr>
<th>Road Class</th>
<th>High density Urban</th>
<th>Medium density Suburban</th>
<th>Low density Urban fringe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1 - Principal Arterials</td>
<td>5 km (5 km)</td>
<td>8 km (6 km)</td>
<td>10 km (10 km)</td>
</tr>
<tr>
<td>Class 2 - Major Arterials</td>
<td>1.5 km (1.7 km)</td>
<td>3 km (3 km)</td>
<td>5 km (5 km)</td>
</tr>
<tr>
<td>Class 3 - Minor Arterials</td>
<td>1.2 km (0.85 km)</td>
<td>2 km (1.5 km)</td>
<td>As required (2.5 km)</td>
</tr>
</tbody>
</table>

- Theoretical provision of major roads/km² can be calculated

<table>
<thead>
<tr>
<th>Road Class</th>
<th>Road length - km/square km</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High density Urban</td>
</tr>
<tr>
<td>Class 1</td>
<td>0.4</td>
</tr>
<tr>
<td>Class 2</td>
<td>0.8</td>
</tr>
<tr>
<td>Class 3</td>
<td>1.2</td>
</tr>
<tr>
<td>Total for Class 1, 2 and 3</td>
<td>2.4</td>
</tr>
</tbody>
</table>
SPACING MAJOR ROADS (2)

- How does reality comply with “ideal spacing”
- Analysis of ± 50% of Cape Town (688 km²), yields:

<table>
<thead>
<tr>
<th>City of Cape Town built-up areas</th>
<th>Analysis of supply of km of Class 1, 2 and 3 arterials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone</td>
<td>Area sq km</td>
</tr>
<tr>
<td>Southern Suburbs</td>
<td>64</td>
</tr>
<tr>
<td>South S Suburbs</td>
<td>49</td>
</tr>
<tr>
<td>NI corridor</td>
<td>192</td>
</tr>
<tr>
<td>West Coast</td>
<td>143</td>
</tr>
<tr>
<td>South East Sector</td>
<td>240</td>
</tr>
<tr>
<td>Total</td>
<td>688</td>
</tr>
</tbody>
</table>

| Ratio km/sqkm                   | 0,33       | 0,33     | 0,55 | 1,21 |
| Ideal ratio km/sqkm             | 0,33       | 0,33     | 0,67 | 1,33 |

| Ideal km                        | 227        | 227      | 461  | 915  |
| Shortfall                       | -2         | -1       | 85   | 82   |
Results:

- Class 1 and 2 routes – close to “ideal” provision
- Class 3 routes – under provided by ± 10%
- Previous investigation revealed under provision of Class 2 and 3 routes in a major east/west corridor
COMPARISON INTERNATIONAL CITIES

- Strategic (high level, cursory) assessment of four other cities – Berlin, Dallas, Melbourne, Shanghai

  - Berlin - pop 3.4 m
    - capital and largest city Germany
    - car ownership 360/1 000 persons
  - Dallas - pop 6.7 m (Dallas/Fort Worth/Arlington)
    - fourth largest metro in USA
    - car ownership ± 800/1 000 persons
  - Melbourne - pop 4.25 m
    - second largest city in Australia
    - car ownership 850/1 000 persons
  - Shanghai - pop 17.8 (highest in world)
    - at mouth of Yangtze River
  - Cape Town - pop 4.0 m
    - second largest city in SA
    - car ownership ± 180/1 000 persons
Übergeordnetes Straßennetz
Bestand 2012

Übergeordnetes Straßennetz, Bestand 2012

- Stufe I (großräumige Straßenverbindung)
- Stufe II (übergeordnete Straßenverbindung)
- Stufe III (örtliche Straßenverbindung)
- Ergänzungsstrassen (Straßen von besonderer Bedeutung)

Stand: August 2012
Senatsverwaltung für Stadtentwicklung und Umwelt
Abteilung VII
BERLIN

- Six Class 1 routes radiating from centre
- Class 2 ring road completed (5 km in diam), partial Class 1 ring road
- Class 2 routes form blocks of varying size, 0.8 to 2 km apart

Conclude that Berlin has relatively dense network of higher order roads, even closer than “ideal” spacing.

DALLAS

- Radial network of 8 Class 1 routes from CBD stretching in all directions
- Class 1 ring road around CBD of ± 2 x 2.5 km, Second Class 1 ring of 40 km in diam, Third almost complete ring of 50 km in diam
- Other major routes forming blocks of 1.6 x 1.6 km, some even closer

Conclude that Dallas also has relatively dense network of higher order roads, many cases closer than “ideal” spacing
MELBOURNE

• Five Class 1 routes radiating from central area

• Class 2 and 3 routes largely grid pattern of 1.6 x 1.6 km

• Class 1 ring road (36 to 38 km diam) partially completed

Concluded that Melbourne’s Class 1 network is less dense, but still close to “ideal” spacing. Class 2 and 3 routes largely complying to “ideal” spacings.

SHANGHAI

• At least 3 ring roads – at ± 12 km, ± 30 km and ± 70 km diam

• Spacing of Class 2 and 3 routes difficult to ascertain – appears to vary between 1 and 3 km in central area (within 30 km ring)

Concluded that Shanghai has relatively dense network within 30 km ring, which ± comply with “ideal” spacing.
CAPE TOWN

• Generally radial major roads focussing on CBD

• Class 1 routes between 5 and 12 km apart

• Class 2 and 3 routes ± grid, 1.5 to 3 km apart

Concluded that Class 1 network is ± complying with “ideal” spacing, but other high order routes slightly under provided.

Overall Conclusion

Based on this cursory evaluation of higher order routes:

• Actual spacing appears to be close to “ideal” spacing

• Standards for spacing appear to be realistic

• All cities – elements of radial routes, ring roads and rectangular grid in between

• Characteristics of different classes can differ substantially
ACCESS SPACING AND REAL WORLD

• Literature suggests criteria – how to apply?

Weaving Distance (WD)
Signal Progression (SIG)
Communication Criteria (CC)
Stopping Sight Distance (SSD)
Functional Boundary Distance (FBD)
Left Turn/Right Turn Conflict (RTC)

• In SA, two approaches:

Western Cape – Selected criteria for specific circumstances (based on judgement)

National: Mobility routes - two way progression, 600 to 800 m, access to property not allowed
Access streets - intersections 150 to 250 m, access to property 15 to 50 m
APPLICATION OF STANDARDS TO REGIONAL SHOPPING CENTRE

• ± 100 000 m² of GLA (or ± 1 m ft²)

• Site of 600 x 600 m required

• Open 7 days a week – peak hour trip generation reduced slightly – still ± 4 000 – 4 500 veh/h

• At least 3 signalised intersections to link with major road network

• Dilemma: signals not allowed in 600 m block length

• Example Cape Town
• Issue also illustrated

• Practical situations which cannot be serviced with available standards/guidelines

• Only solution is decision “on basis of policy”

• Can ideal situation ever be achieved?
Approach proposed for practical application:

- Develop/adopt AM policy
- Classify road network
- Make road classification available to land owners/developers
- Refuse rezoning requiring access which is in contradiction to policy
- Don’t allow intersection control (signals) at improper spacings – use marginal/partial access
- Develop arterial management plans indicating planning of accesses
- Retrofit where access conditions are poor
APPLICATION AM IN PRACTICE

- Gradually upgrade mobility wherever possible
- Employ traffic calming on access streets to encourage use of mobility routes
CONCLUSIONS

• Actual spacing of higher order routes is close to “ideal” spacing

• Standards for spacing of higher order routes appear to be realistic

• Characteristics of road classes differ worldwide

• Practical situations exist which cannot be served by standards/guidelines that have been developed

• Only solution is decisions “based on policy”

• Development of arterial (access) management plans important to provide guidance to land owners/developers